

US006953511B2

(12) United States Patent Bowles, Jr. et al.

(10) Patent No.: US 6,953,511 B2 (45) Date of Patent: Oct. 11, 2005

(54)	METHOD FOR HIGH DEFINITION DIP TRANSFER PRINTING AND ARTICLE MADE ACCORDING TO METHOD					
(75)	Inventors:	Royce J. Bowles, Jr., Fortson, GA (US); James Patrick Epling, Downingtown, PA (US); James Phillip Hand, Columbus, GA (US); Samuel C. Ruffner, Columbus, GA (US); Jeffery Wayne Walker, Columbus, GA (US)				
(73)	Assignee:	Immersion Graphics Corporation, Columbus, GA (US)				
(*)	Notice:	Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 211 days.				
(21)	Appl. No.: 09/901,210					
(22)	Filed:	Jul. 9, 2001				
(65)	Prior Publication Data					
	US 2003/0007053 A1 Jan. 9, 2003					
(51)	Int. Cl. ⁷	B44C 1/ 175 ; B41M 3/12; B41M 1/14; B05D 1/38; B05D 1/20				
(52)	U.S. Cl					
(58)	Field of Search					
(56)	References Cited					
	U.S. PATENT DOCUMENTS					

11/1949 Barnola 154/98

2,489,987 A

2,981,632 A 4/1961 Bennett 117/39 4,231,829 A * 11/1980 Marui et al. 156/230 4,269,650 A 5/1981 Arai et al. 156/540 4,378,387 A 3/1983 Mitchell 427/263 4,436,571 A * 3/1984 Nakanishi 156/384 5,695,587 A * 12/1997 Dumoux 156/230 5,727,253 A 3/1998 Wilkinson 2/69 5,908,525 A 6/1999 Zaher 156/230 5,916,400 A 6/1999 Zaher 156/230 5,924,131 A 7/1999 Wilkinson 2/69
4,269,650 A 5/1981 Arai et al. 156/540 4,378,387 A 3/1983 Mitchell 427/263 4,436,571 A 3/1984 Nakanishi 156/384 5,695,587 A 12/1997 Dumoux 156/230 5,727,253 A 3/1998 Wilkinson 2/69 5,908,525 A 6/1999 Zaher 156/230 5,916,400 Λ 6/1999 Zaher 156/230 5,924,131 A 7/1999 Wilkinson 2/69
4,378,387 A 3/1983 Mitchell 427/263 4,436,571 A 3/1984 Nakanishi 156/384 5,695,587 A 12/1997 Dumoux 156/230 5,727,253 A 3/1998 Wilkinson 2/69 5,916,400 Λ 6/1999 Zaher 156/230 5,924,131 A 7/1999 Wilkinson 2/69
4,436,571 A * 3/1984 Nakanishi 156/384 5,695,587 A * 12/1997 Dumoux 156/230 5,727,253 A 3/1998 Wilkinson 2/69 5,908,525 A 6/1999 Zaher 156/230 5,916,400 A 6/1999 Zaher 156/230 5,924,131 A 7/1999 Wilkinson 2/69
5,695,587 A * 12/1997 Dumoux 156/230 5,727,253 A 3/1998 Wilkinson 2/69 5,908,525 A 6/1999 Zaher 156/230 5,916,400 A 6/1999 Zaher 156/230 5,924,131 A 7/1999 Wilkinson 2/69
5,727,253 A 3/1998 Wilkinson 2/69 5,908,525 A 6/1999 Zaher 156/230 5,916,400 A 6/1999 Zaher 156/230 5,924,131 A 7/1999 Wilkinson 2/69
5,908,525 A 6/1999 Zaher 156/230 5,916,400 A 6/1999 Zaher 156/230 5,924,131 A 7/1999 Wilkinson 2/69
5,916,400 A 6/1999 Zaher
5,924,131 A 7/1999 Wilkinson 2/69
,,
2 004 004 1
6,001,206 A 12/1999 Zaher 156/230
6,044,764 A 4/2000 Ogisu 101/492
6,070,636 A 6/2000 Zaher 156/540
6,103,043 A 8/2000 Lin 156/237

FOREIGN PATENT DOCUMENTS

EP	0 918 078 A1 *	5/1999	C09D/11/00
JP	56082256 A2	7/1981	
JP	61130081 A	6/1986	
JP	03-063199 *	3/1991	B44C/1/175
JР	11180098 A2	7/1999	

^{*} cited by examiner

Primary Examiner—J. A. Lorengo (74) Attorney, Agent, or Firm—Peter G. Pappas, Esq; Sutherland Asbill & Brennan LLP

(57) ABSTRACT

Method for high definition printing to be dip transferred to a three-dimensional article comprises four color process printing a digital image from a digital image file onto a water soluble polymer film with solvent based ink to form a printed water soluble film and dip transfer printing the solvent based ink image through transcription on the surface of the article. The method is suitable for printing three-dimensional articles of a variety of shapes with high definition, photographic-quality images. The method is particularly suitable for decorating articles with complex images such as camouflage patterns.

13 Claims, No Drawings